FIGURE 1

```
          91                                                  140
   HSA    APPLVSIIMTSHNTEKFIEASINSLLLQTYNNLEVIVVDDYSTDKTFQIA
   KfiC   GKDLVSIIMSVFNSEDTIAYSLHSLLNQTYENIEILVCDDCSSDKSLEII
Consensus ...LVSIIM*..N*E..I..S..SLL.QTY#N.E!.V.DD.S*DK*.#I.


          141                                                 190
   HSA    SRIANSTSKVKTFRLNSNLGTYFAKNTGILKSKGDIIFFQDSDDVCHHER
   KfiC   KSIAYSSSRVKVYSSRKNQGPYNIRNELIKKAHGNFITFQDADDLSHPER
Consensus ..IA.S*S*VK.%....N.G.Y...N..I.K..G#.I.FQD.DD..H.ER


          191                                                 240
   HSA    IERCVNALLSNKDNIAVRCAYSRINLETQNIIKVNDNKYKLGLITLGVYR
   KfiC   IQRQVEVLRNNKAVICM.ANWIRVASNGKIQFFYDDKATRMSVVSSMIKK
Consensus I#R.V#.L..NK..I.......R!..#.......#D...*$..!*..!.*
```

```
          441                                                 490
   HSB    YITCDDDIRYPADYINTMIKKINKYND.KAAIGLHGVIFPSRVNKYFSSD
   KfiA   IVLTDDDIIYPPDYVEKMLNFYNSFAIFNCIVGIHGCIYIDAFDGD.QSK
Consensus .!..DDDI.YP.DY!#.M....N.%......!G.HG.I%....#....S.


          491                                                 540
   HSB    RIVYNFQKTFRKDTAVNILGTGTVAFRVSIFNKFSLSDFEHPGMVDIYFS
   KfiA   RKVFSFTQGLLRPRVVNQLGTGTVFLKADQLPSLKYMDGSQR.FVDVRFS
Consensus R.V%.F.....*...VN.LGTGTV..*..........D......VD!.FS
```
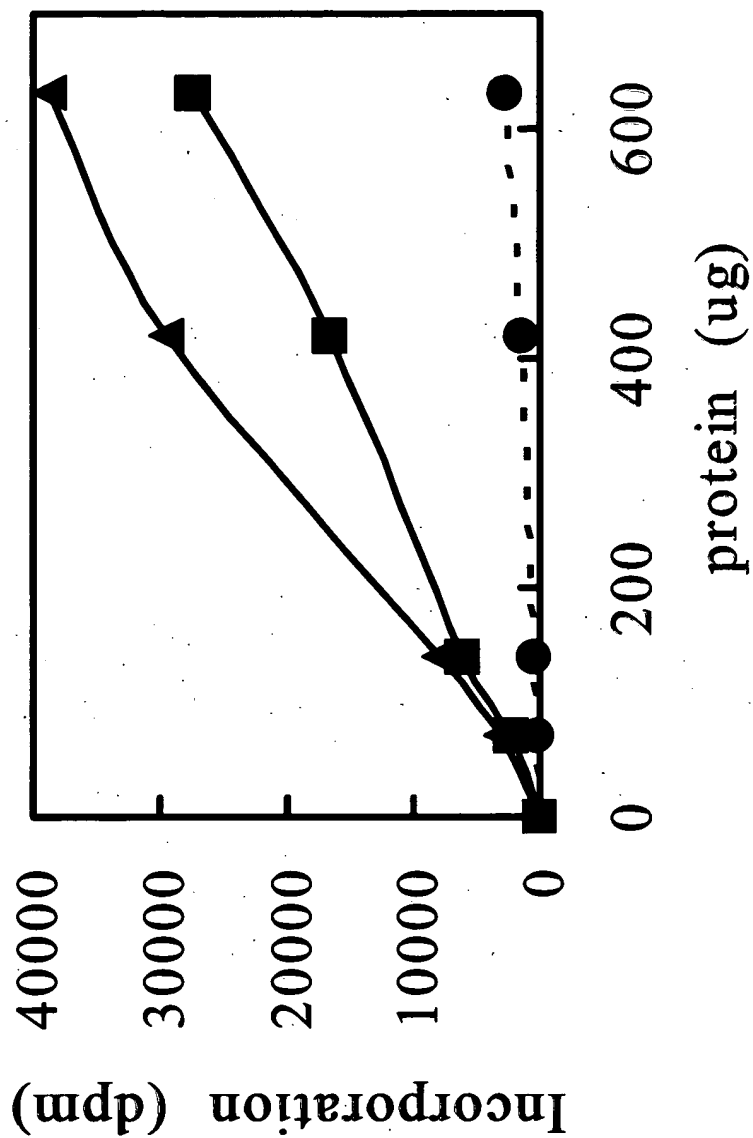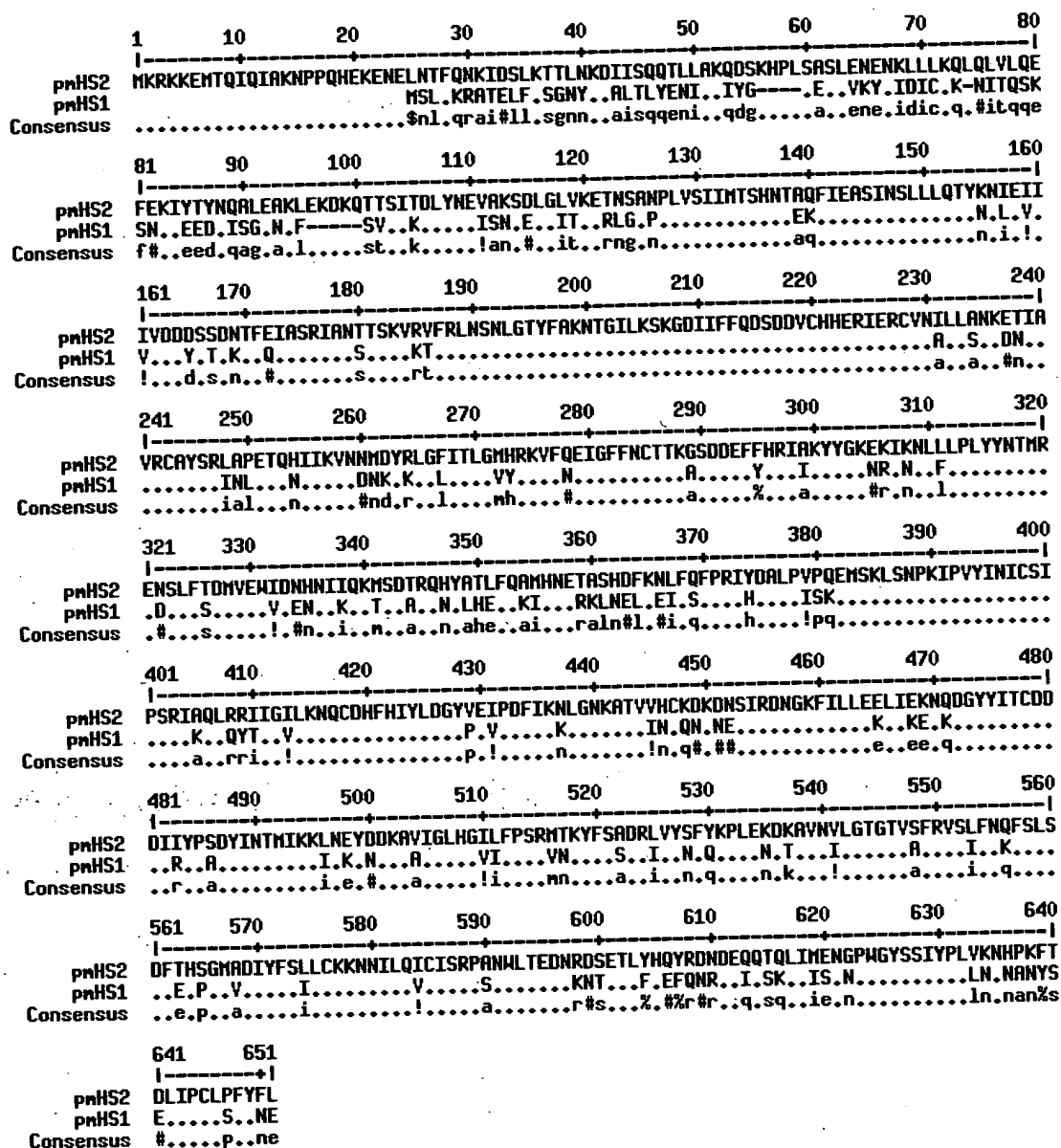
FIG. 1 cont'd.

EXPRESS MAIL NO.: EL 984585238 US   DATE DEPOSITED: 03/31/2004
Serial No.:   Not Yet Assigned
Title: HEPARIN/HEPAROSAN SYNTHASE FROM P.MULTOCIDA,
                      SOLUBLE AND SINGLE ACTION CATALYSTS THEREOF AND
                      METHODS OF MAKING AND USING SAME
Inventor: Paul DeAngelis   Group: Unknown
Filed: March 31, 2004
Agent: Kathryn L. Hester, Ph.D.   Examiner: Unknown
Docket No.   4599.014
SHEET 3 OF 10   DRAWINGS

FIG. 2

FIGURE 3

```
          1         10        20        30        40        50        60        70        80
          |---------+---------+---------+---------+---------+---------+---------+---------|
pnHS2     MKRKKEMTQIQIAKNPPQHEKENELNTFQNKIDSLKTTLNKDIISQQTLLAKQDSKHPLSASLENENKLLLKQLQLVLQE
pnHS1                       MSL.KRATELF.SGNY..ALTLYENI..IYG----.E..VKY.IDIC.K-NITQSK
Consensus ..................$nl.qrai#ll.sgnn..aisqqeni..qdg.....a..ene.idic.q.#itqqe

          81        90        100       110       120       130       140       150       160
          |---------+---------+---------+---------+---------+---------+---------+---------|
pnHS2     FEKIYTYNQRLEAKLEKDKQTTSITDLYNEVAKSDLGLVKETNSANPLVSIIMTSHNTAQFIEASINSLLLQTYKNIEII
pnHS1     SN..EED.ISG.N.F-----SV..K.....ISN.E..IT..RLG.P............EK...............N.L.V.
Consensus f#..eed.qag.a.l.....st..k.....!an.#..it..rng.n............aq...............n.i.!.

          161       170       180       190       200       210       220       230       240
          |---------+---------+---------+---------+---------+---------+---------+---------|
pnHS2     IVDDDSSDNTFEIASRIANTTSKVRVFRLNSNLGTYFAKNTGILKSKGDIIFFQDSDDVCHHERIERCVNILLANKETIA
pnHS1     V...Y.T.K..Q.......S....KT..............................................A..S..DN..
Consensus !...d.s.n..#.......s....rt..............................................a..a..#n..

          241       250       260       270       280       290       300       310       320
          |---------+---------+---------+---------+---------+---------+---------+---------|
pnHS2     VRCAYSRLAPETQHIIKVNNMDYRLGFITLGMHRKVFQEIGFFNCTTKGSDDEFFHRIAKYYGKEKIKNLLLPLYYNTMR
pnHS1     .......INL...N.....DNK.K..L....VY....N...........A.....Y...I....NR.N..F.........
Consensus .......ial...n.....#nd.r..l....mh....#...........a.....%...a.....#r.n..l.........

          321       330       340       350       360       370       380       390       400
          |---------+---------+---------+---------+---------+---------+---------+---------|
pnHS2     ENSLFTDMVEWIDNHNIIQKMSDTRQHYATLFQAMHNETASHDFKNLFQFPRIYDALPVPQEMSKLSNPKIPVYINICSI
pnHS1     .D...S.....V.EN..K..T..A..N.LHE..KI...RKLNEL.EI.S....H....ISK................
Consensus .#...s.....!.#n..i..m..a..n.ahe..ai...raln#l.#i.q....h....!pq................

          401       410       420       430       440       450       460       470       480
          |---------+---------+---------+---------+---------+---------+---------+---------|
pnHS2     PSRIAQLRRIIGILKNQCDHFHIYLDGYVEIPDFIKNLGNKATVVHCKDKDNSIRDNGKFILLEELIEKNQDGYYITCDD
pnHS1     ....K..QYT..V.................P.V.....K.......IN.QN.NE............K..KE.K........
Consensus ....a..rri..!.................p.!.....n........!n.q#.##............e..ee.q........

          481       490       500       510       520       530       540       550       560
          |---------+---------+---------+---------+---------+---------+---------+---------|
pnHS2     DIIYPSDYINTMIKKLNEYDDKAVIGLHGILFPSRMTKYFSADRLVYSFYKPLEKDKAVNVLGTGTVSFRVSLFNQFSLS
pnHS1     ..R..A.........I.K.N...A.....VI....VN....S..I..N.Q....N.T...I.......A....I..K....
Consensus ..r..a.........i.e.#...a.....!i....mn....a..i..n.q....n.k...!....a....i..q....

          561       570       580       590       600       610       620       630       640
          |---------+---------+---------+---------+---------+---------+---------+---------|
pnHS2     DFTHSGMADIYFSLLCKKNNILQICISRPANWLTEDNRDSETLYHQYRDNDEQQTQLIMENGPWGYSSIYPLVKNHPKFT
pnHS1     ..E.P..V.....I..........V......S.......KNT...F.EFQNR..I.SK..IS.N...........LN.NANYS
Consensus ..e.p..a.....i...........!.......a........r#s...%.#%r#r..q.sq..ie.n...........ln.nan%s

          641       651
          |---------+|
pnHS2     DLIPCLPFYFL
pnHS1     E.....S..NE
Consensus #.....P..ne
```
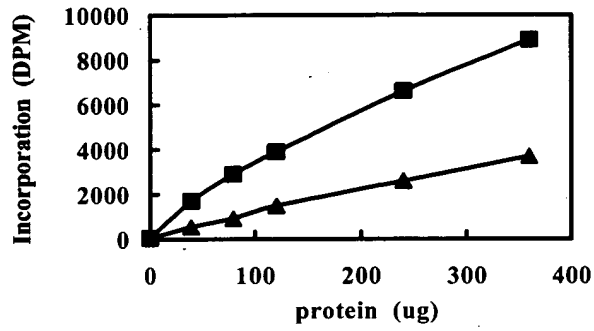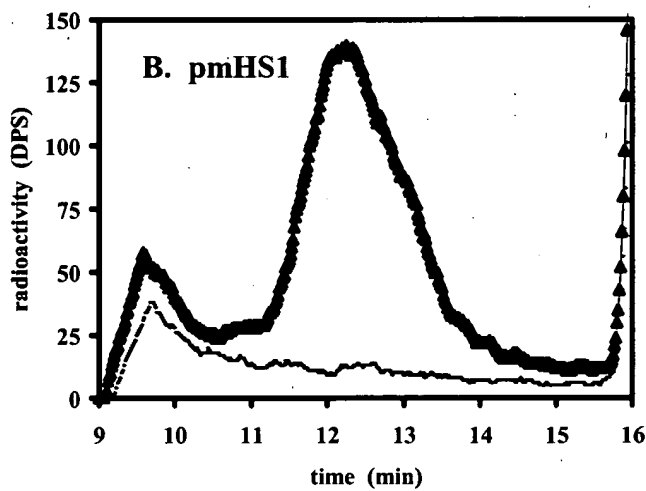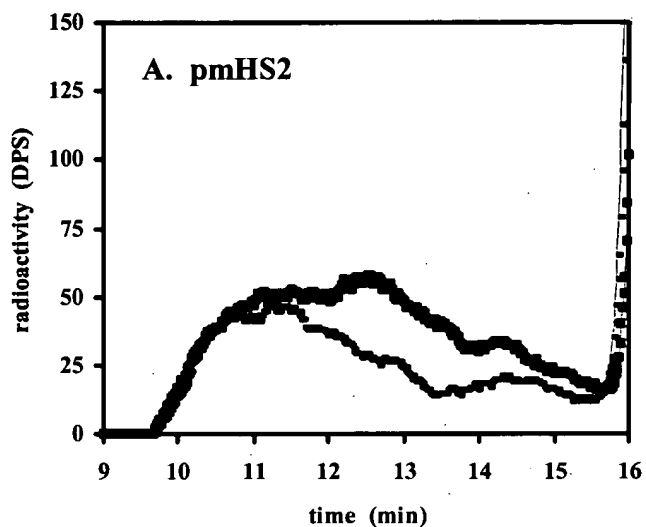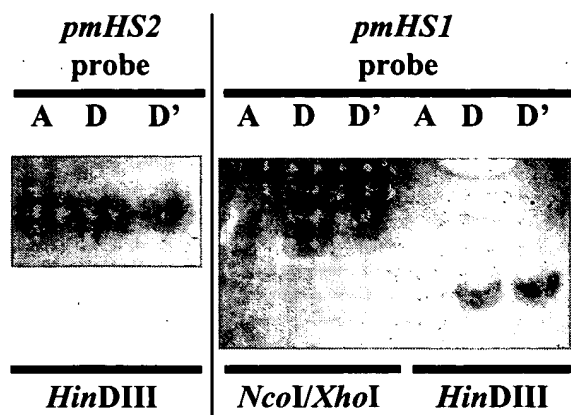
FIGURE 4

vec   pmHS1   pmHS2

c

FIGURE 5

FIGURE 6

FIGURE 7

pmHS2 probe	pmHS1 probe	
A D D'	A D D'	A D D'
HinDIII	NcoI/XhoI	HinDIII

FIGURE 8

Schematic Models of *Pasteurella* GAG synthase
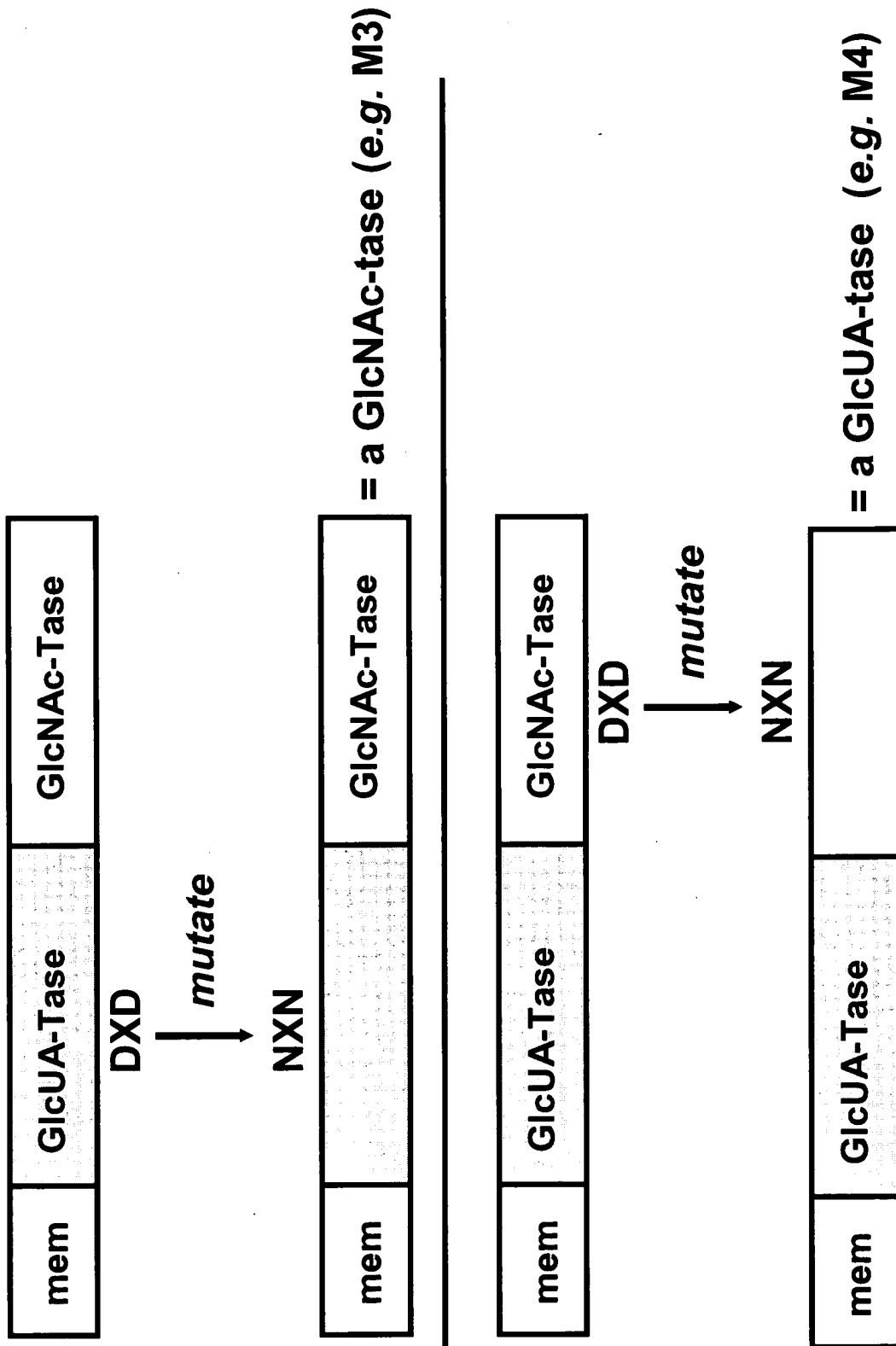## transferase sites & membrane association regions

pmHAS

GlcNAc-Tase	GlcUA-Tase	mem

N C

pmCS

GalNAc-Tase	GlcUA-Tase	mem

N C

pmHS1 & pmHS2

mem	GlcUA-Tase	GlcNAc-Tase

N C

FIGURE 9

mem | GlcUA-Tase | GlcNAc-Tase

DXD

$\downarrow$ *mutate*

NXN

mem | GlcNAc-Tase   = a GlcNAc-tase (e.g. M3)

---

mem | GlcUA-Tase | GlcNAc-Tase

DXD

$\downarrow$ *mutate*

NXN

mem | GlcUA-Tase   = a GlcUA-tase (e.g. M4)